EUM LIBRARY

DIVISION OF FISHES
MUSEUM OF ZOOLOGY
UNIVERSITY OF MICHIGAN

JUN 24 '48

COMMERCIAL FISHERIES REVIEW

JUN 29 1948

Vol. 10, No. 4 APRIL 1948

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
J.A.KRUG, Secretary

FISH AND WILDLIFE SERVICE
ALBERT M. DAY, Director

COMMERCIAL FISHERIES REVIEW

A REVIEW OF DEVELOPMENTS AND NEWS OF THE FISHERY INDUSTRIES
PREPARED IN THE BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor
F. F. Johnson, Associate Editor
Wm. H. Dumont and J. Pileggi, Assistant Editors

Applications for COMMERCIAL FISHERIES REVIEW, which is mailed free to members of the fishery industries and allied interests, should be addressed to the Director, Fish and Wildlife Service, United States Department of the Interior, Washington, 25, D.C.

The contents of this publication have not been copyrighted and may be reprinted freely; however, reference to the source will be appreciated. The Service assumes no responsibility for the accuracy of material from outside source.

CONTENTS

COVER: RETAIL STORE IN ST. LOUIS, MO., FLUORESCENTLY ILLUMINATED WITH TILING AND STAINLESS STEEL TRIMMING THROUGHOUT, INCLUDING INTERIOR AND EXTERIOR OF CASES. TRANSPARENT LUCITE COVERS ON CASES.

COMMERCIAL FISHERIES REVIEW

April 1948 Washington 25, D.C. Vol.10, No.4

FISH MARKETING IN COLORADO AND THE DEVELOPMENT OF GREATER MARKETS[1/]

By Clarence R. Lucas*

INTRODUCTION

The fishery industries, in planning their future, might well look at fish marketing in the Rocky Mountain Region. There, with frozen fishery products displayed in almost every grocery outlet, fish is often more generally available to homemakers than in many producing areas.

Because fish are marketed frozen almost exclusively, stores are able to handle small lines of seafoods with very little spoilage and food merchants are not averse to the handling of fish. With few exceptions, the only "butchering" done consists of the slicing of halibut and salmon steaks, and many stores avoid even that operation by buying fish already sliced.

WHOLESALE

Seven wholesalers--four in Denver, one in Colorado Springs, one in Pueblo, and one in Grand Junction--receive most of the fresh and frozen fish and shellfish sold in Colorado. Although Denver, the largest city, contains some 333,000 persons, most of the trade is in the many small towns of this State of 1,250,000 people.

There are also a number of brokers, mainly in Denver, who supply canned, bottled, dried, kippered, smoked, pickled, and salted fishery products to the retailers of the State.

Colorado's wholesalers, who also supply a considerable part of the market in Wyoming, are assisted by sales agents at central points in and outside of the State. The main plants have well-chosen locations, are neat and modern, with ample packing and storage space.

Wholesalers obtain their products from all fish-producing areas of the United States, but particularly from the Pacific Northwest and New England. Halibut and

*Fishery Marketing Specialist, Market Development Section, Branch of Commercial Fisheries, Denver, Colorado.

1/This report is based largely on interviews with wholesalers in Denver, Pueblo, and Grand Junction and some 40 or more retailers in Denver, Boulder, Colorado Springs, Pueblo, Steamboat Springs, and Grand Junction during the course of a Market Development Survey in October 1947.

salmon arrive mostly by truck from the Pacific Northwest, while many railway carloads and truck-loads of frozen fillets from New England are received. Commercial insulated shipping containers are used in shipping smaller frozen fish shipments by railway express, particularly during summer months. Fresh salmon, shrimp from the Gulf of Mexico, East Coast oysters, fresh-water fish from the Great Lakes, and fillets from the Pacific Northwest and the Gulf of Mexico arrive chiefly by express, iced, in wooden boxes.

Wholesalers pack and ship any size of order desired. Most retailers prefer to order salmon and halibut whole, but wholesalers often provide these fish sliced, ready for the display case. Orders are taken a week in advance. As few retailers have much reserve storage space, orders are usually restricted to supplies for two or three days, and usually two shipments are received each week--on Monday or Tuesday and on Wednesday or Thursday.

Almost all distribution from the wholesaler's plant is by truck, although a few points are supplied by rail. Through much of eastern and northern Colorado, many deliveries are made by the wholesaler's own trucks. Commercial truck lines, operating over most of the State's 12,000 odd miles of highways, give reliable door-to-door service on large and small shipments, even during the winter months. Losses during shipment are slight.

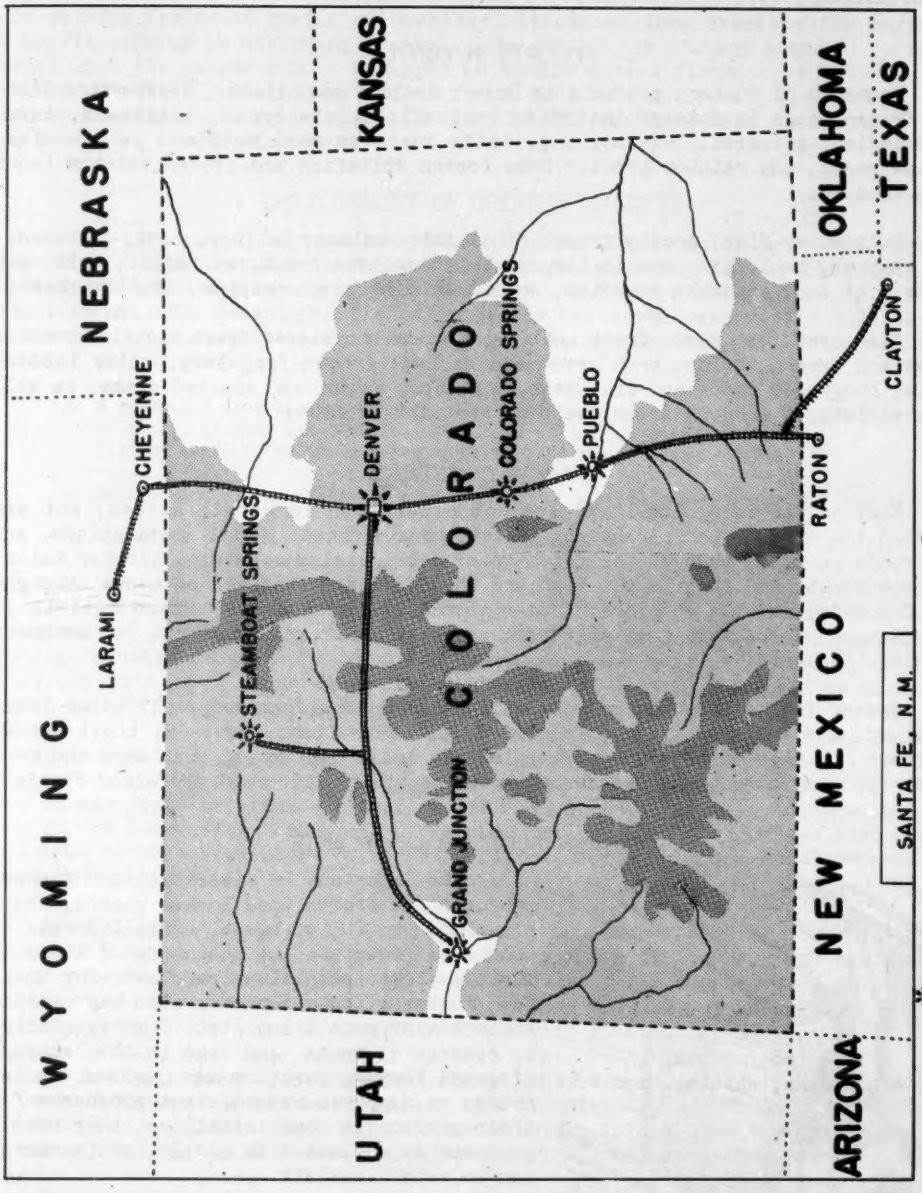
RETAIL

Nearly every retail food store in Colorado that operates a meat counter devotes a section of that counter to fish and shellfish. The bulk of the retail grocery business is handled through chain stores, and these, almost without exception, carry fish. Many stores display fish throughout the week though all have the bulk of their sales on Thursdays and Fridays. Clerks reported that little additional demand was evident on Tuesdays when meatless Tuesdays were instituted. Sales of 200 to 500 pounds per week are normal for chain store units that maintain orderly displays. Sales drop during the summer and reach their peak in the winter months.

Some retailers appear to restrict their sales by short-sighted pricing. Although many outlets obviously use a reasonably low and uniform percentage mark-up on all items, others seemingly raise prices to the point where they are out of proportion to the prices of competitive foods.

In general, retail displays are well-cared-for and attractive. One clerk, particularly proud of his fish display, stated that his sales are directly proportionate to the attractiveness of the articles and their arrangement in the showcase. The direct relationship of sales to the attractiveness of the display is emphasized by the experiences of other retailers and is substantiated by the neatness of successful display cases.

Retail food stores, in general, display in their meat counters salmon and halibut steaks, whiting, and wrapped groundfish fillets, Most displays include also one or more of the following items: sablefish steaks, bullheads, smelt, shucked oysters, and green or cooked shrimp. In addition, packaged products are sold from frozen food cabinets. Packaged items usually seen include groundfish fillets; i.e., haddock, cod, and rosefish, and precooked creamed tuna and salmon. Wrapped fillets in meat display cases have much heavier sale than packaged fillets in frozen food dispensers.


WYOMING
NEBRASKA
KANSAS
COLORADO
UTAH
NEW MEXICO
OKLAHOMA
TEXAS
ARIZONA
LARAMI
CHEYENNE
STEAMBOAT SPRINGS
DENVER
COLORADO SPRINGS
PUEBLO
GRAND JUNCTION
RATON
CLAYTON
SANTA FE, N.M.
WHOLESALE SUPPLY CENTERS
SUPPLIED BY COLORADO WHOLESALERS

Several retail stores specialize in fishery products, carrying a variety of fresh and frozen fish and shellfish, and in addition, smoked, salted, and pickled items. Three of these stores, located in public markets in Denver, also carry fresh poultry.

RECEIPTS IN DENVER

Receipts of fishery products in Denver include many items. Fresh-water fish, not frozen, seen in October included: whitefish, lake trout, bullheads, carp, buffalofish, pickerel, lake herring, white bass, channel catfish, yellow pike, yellow perch, and rainbow trout. Some frozen whitefish and frozen rainbow trout were handled.

Salt-water fish, mostly frozen, included: salmon, halibut, tuna, barracuda, red snapper, sablefish, smelt, lingcod, whiting, sea trout, swordfish, eels, and fillets of cod, haddock, rosefish, sole, whiting, red snapper, and mackerel.

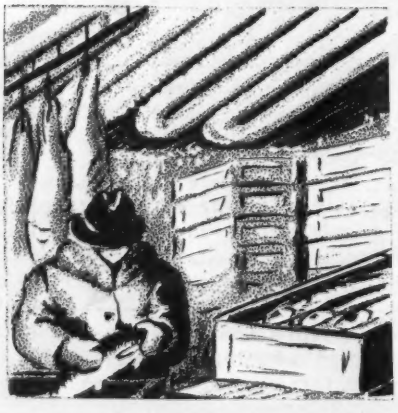
Also available were: fresh and frozen eastern oysters; fresh Pacific oysters; fresh and frozen shrimp, both green and cooked; frozen frog legs, spiny lobster tails, Dungeness crabs and crab meat, scallops, squid, and shucked clams; as well as a variety of smoked, dried, salted, and pickled fish.

MARKET CONDITIONS

Many of the foregoing items are not often seen in retail stores, but are handled for other types of buyers. Hotels, restaurants, public institutions, and railroads purchase much of the fresh-water fish, shrimp, oysters, lobster tails, rainbow trout, and frog legs. Fish and shellfish are featured on menus throughout Colorado, and the volume of fishery products consumed by these outlets is very large. There also are large mail-order sales of rainbow trout for shipment outside the State.

Demand for halibut and salmon easily exceeds the demand for all other items combined, despite relatively high prices for these fish. However, there was an increase in sales of dressed whiting in late 1947, indicating that more and more purchasers may have become concerned over the rising prices of preferred species.

FROZEN FOOD LOCKER PLANTS



Also important in distribution of fishery products are frozen food locker plants. There are close to 200 of these establishments in Colorado. Adaptable to the needs of the community, these plants may purchase for their food locker clients alone or also may operate wholesale or retail outlets. Some specialize in commercial meats and some in the storage of game. They may purchase through local wholesalers or send orders to distant producers for their goods. In some localities, they resell products at wholesale to hotels, restaurants, and to retail outlets.

As the locker plant movement has developed, there has been a gradual increase in the num-

ber of services performed by the individual plant. Although comparatively few plants now handle fishery products, it can safely be predicted that, in a few years, many more plants will carry fish and shellfish. In the small farming communities of Colorado, where the locker plant is forced to diversify its operations into as many fields of profit as possible, it cannot long overlook the margins of profit offered in marketing of fish. The demand for fishery products is universal, and the locker plant, equipped to handle frozen fishery products with a minimum of additional care and expense, will soon be distributing fish and shellfish to thousands of rural inhabitants who heretofore have been inaccessible to the fresh and frozen fishery products.

DEVELOPMENT OF GREATER MARKETS

Despite the almost universal handling of frozen fish by Colorado's food stores, fish sales are not large. Homemakers now get stimulation to buy fish only by price appeal, the appearance of fish displays, and the influence of religious restrictions. The demand for fishery products has never been widely cultivated by the fishery industries. To stimulate greater consumption, the following activities are suggested:

1. A sustained advertising campaign of newspaper ads and publicity, distribution of retail display material, contacts with industrial users, and display of fishery exhibits in trade shows, schools, and other vantage points.

2. Maintenance by the wholesalers of a system of special services for the retailers.

3. Organization of a wholesale dealer's association to organize, manage, and finance a market development program.

Greater consumption of fishery products could easily be stimulated by a well-conceived and aggressively executed market expansion program. Because the entire fishing industry benefits by publicity campaigns, and because financing of such publicity on a scale large enough to create widespread response would be an undue burden on any one company, the entire fishing industry should join in such an undertaking. The population density in Colorado is low, and the total population, though larger than that of any other of the Mountain States, is considerably less than 2,000,000. However, the present low per capita consumption of fishery products in the State provides a situation that is, in some respects, favorable to a program for increasing consumption. Furthermore, methods of promotion that prove effective in this area might be applicable to market development elsewhere in the country.

Special publicity efforts should be made to reach the lower-income groups which now consume little fish. The Spanish-American population appears to present a good potential market for whiting, carp, buffalo, croaker, sea trout, groundfish fillets, and other low-priced items. A fair-sized colored population in Denver has, at present, only limited access to low-priced species.

At present, the public's general knowledge of the values of fishery products as food, methods of preparation, and the relative desirability of different species or products is quite limited. Preference of buyers for only two species indicates a lack of familiarity with the many other fishery products available.

Publicity material can be placed effectively before the homemaker in the newspapers, over the radio, in the retail store, and in school and community gatherings, while restaurants, hotels, hospitals, locker plants, and other industrial

users can be reached by exhibits at conventions, by personal contacts, and by contacts with associations. A wide assortment of factual material, recipes, etc., has been designed for these purposes by the U. S. Fish and Wildlife Service while other similar material can be obtained through certain national and local trade organizations.

Maintenance of a retailer contact system should be even more effective in stimulating demand for fish, particularly when bolstered with an intensified publicity campaign. Retailers can make their displays more attractive; instruct their clients in the use of products; call attention to good buys; and keep their stock in better condition. They can learn to order and price their products more effectively and to use recipe books, window streamers, display posters, and other materials in creating new demand and business.

The following trade-sponsored activities can be effective in aiding retailers to sell more fish:

1. Supplying and arranging posters and other promotional materials.

2. Advising and assisting in setting up attractive displays.

3. Obtaining local advertising and promotion through local papers, radio stations and demonstrations.

4. Advising and assisting retailers in reduction of waste and spoilage and methods of keeping products fresh and attractive.

5. Providing merchandising tips, recipe pamphlets and information on nutritive value of the product, to enable salesmen to more fully and adequately serve the customer.

6. Advising consumers as to good buys, abundant varieties, sizes, and characteristics of the product.

7. Introducing and furnishing publications, moving pictures, and other material containing merchandising suggestions to wholesalers, retailers, and other groups.

8. Pricing so as to keep retail margins at a profitable but not exorbitant level and properly related to wholesale prices.

9. Emphasizing the sale of good quality products, properly priced, and well displayed with attractive price tags.

10. Providing good quality products.

THIAMINASE IN FISHERY PRODUCTS: A REVIEW

By Charles F. Lee*

ABSTRACT

Severe losses of silver foxes due to paralysis led to the discovery of a thiamine-destructive substance which was present in the raw fish included in the diet. Only a few fresh-water species were found to contain thiaminase. More recent assays have shown that a few marine fish and shellfish also possess this thiamine-destructive capacity. The review of literature deals with the properties of thiaminase, its distribution in the fish body, and a listing of the various species tested for thiaminase. A similarly-active principle has also been reported in certain products of a plant origin. An attempt is also made to explain the numerous contradictions regarding thiaminase that are found in the literature.

- - - - -

INTRODUCTION

A new disease of foxes was first noted in 1932 on the fur farm of Mr. J. S. Chastek, in Glencoe, Minnesota. The foxes became paralyzed and, in most cases, soon died. Tests were not successful in determining the presence of any virus or bacteria responsible for this and subsequent outbreaks. The diet was then suspected, and the various ingredients of the diets fed were recorded and compared in outbreaks reported from Utah, Idaho, Wyoming, and other places in Minnesota.

It appeared then that onset of "Chastek" paralysis was related to the consumption of raw fish, when this was used instead of the meat which was usually fed. Green, et al, (1937, 1941, and 1942) studied the pathology of the disease, and eventually proved definitely that "Chastek" paralysis was caused by a deficiency of thiamine. Although diets were fed which should be adequate in thiamine, a deficiency was apparently caused by the raw fish which had also been fed in every case. Paralysis may be prevented by feeding large doses of thiamine orally or by injection of thiamine. It may be prevented by not feeding raw fish, by removal of the raw fish from the diet, or by feeding the raw fish on alternate days, or feeding fish at a different time of the day from rest of diet.

These investigators (1942-A) also found that both the viscera and trimmings were more active than the whole carp in producing the paralysis in foxes. The skinned fillets were found to be without effect during the period they were fed. Twenty percent raw, whole carp was mixed into the diet and supplements of 1, 2, 5, and 10 milligrams of thiamine were fed daily to 6 pups. The highest level gave complete protection; whereas, with the 5 milligrams level the thiaminase exerted a slight depressive effect on appetite. There was even some beneficial effect of the supplement at the 1 milligram level.

* Chemical Engineer, Fishery Technological Laboratory, Branch of Commercial Fisheries, College Park, Maryland.

THE ANTI-THIAMINE FACTOR

These papers stimulated interest in this thiamine-destructive factor which was the first "anti-vitamin" to be reported. The only previous comparable observation in the field of nutrition was the biotin-avidin relation when raw egg white was fed. Apparently the disease studied was an uncomplicated thiamine deficiency. This was confirmed by feeding the raw fish to cats (Smith and Proutt, 1944) and chicks (Spitzer, et al, 1941) with production of typical deficiency symptoms. Most of the work since 1941 has been directed towards a study of the active principle involved: methods of extraction and concentration, assay, properties, and the nature of its reaction with thiamine. To a lesser extent, its distribution in the body of the fish has been studied. A few investigators have sought to determine which of the many species of fish and shellfish contain the destructive factor.

Green, et al, (1942) have suggested the possibility that the reaction between thiamine and the destructive factor was enzymatic. Development of in vitro techniques greatly simplified the study of its various properties. The whole fish or viscera were finely ground and were either diluted with water to form a suspension, or the active principle was extracted with a 10 percent solution of sodium chloride. Thiamine was then added to the preparation and it was incubated for 2 hours or longer at 20° to 37° C. The thiamine remaining was determined by the thiochrome method or other chemical methods. Sealock, et al, (1943) standardized the assay and established as an empirical unit value for the thiamine-destructive principle, the amount which would destroy 1 micromole[1/] of thiamine under these standard conditions.

Woolley (1941) was probably one of the first investigators to study the properties of the destructive principle by chemical methods. He reported that 100 grams of ground whole carp would destroy 150 to 190 micrograms out of 200 micrograms of added thiamine. On dialysis, he found that the active principle was made up of two fractions. However, neither the dialysate nor the non-dialysable fraction exhibited thiamine-destructive activity when used alone. He estimated that one-fourth of the total activity in the carp was in the head, three-eighths in the viscera, and three-eighths in the rest of the body of the fish.

Spitzer, et al, (1941) found 100 percent destruction of lower levels of added thiamine within 15 minutes when only the entrails were used. The amount of thiamine added was varied from 100 to 600 micrograms and destruction of the larger quantities was found to be proportional, within certain limits, to time, and the amount of entrails. Their work with chicks verified the observation that the viscera had greater activity for destruction of thiamine. When flesh, skin, and heads and tails were fed, they also produced thiamine deficiency symptoms in all animals.

These investigators, as well as Green, et al, (1942), have reported that the substance was heat labile since a diet of cooked carp caused no thiamine deficiency symptoms. Also the rate of reaction, and the relation of quantity of thiamine destroyed to amount of destructive principle were all suggestive of an enzymatic reaction. Sealock, et al, (1943), made probably the most extensive chemical study of the "fish principle" reported in the literature. They determined the quantitative relation of the amount of destruction of thiamine to the pH in the range of 6 to 10.5. Thiamine loss was correlated to the temperature over the range 20° to 75° C. and the amount of active extract per 10 milliliters of incubated mixture. The rate of destruction of thiamine up to 5 hours of incubation at 37.5° C.,

1/ One micromole equals one millionth of a molecular weight or 337 micrograms of thiamine.

and the rate of inactivation of the destructive principle in a boiling water bath were also determined. It was found that the rate of destruction of thiamine was maximal at a pH of 9.1 and temperature of 60° C. The results of all these studies strongly suggested the enzymatic nature of the reaction. The enzyme is of a protein nature, as indicated by its behavior with a number of protein precipitating reagents, for example, trichloroacetic acid, ammonium sulfate, etc. The reaction is different from the biotin-avidin relationship, as indicated by failure to release the thiamine in an active form by either hydrolysis, proteolytic digestion, or destruction with heat of the anti-vitamin principle.

Sealock, et al, (1943) suggested that the thiamine-destructive principle might be considered a "thiaminase," since it is an enzyme of which thiamine is the substrate, and this term has been frequently so used in recent literature. A more specific name would be desirable especially since Bonner and Buchman (1938) have already given the name "thiaminase" to an enzyme in pea roots which resynthesizes thiamine from its two component heterocycles. However, in the interest of simplicity, the destructive enzyme found in fish will be referred to as thiaminase in the balance of this review.

In 1944, Sealock and Goodland found further conclusive evidence of the enzymatic nature of thiaminase in the inhibiting effect on the rate of thiamine destruction of a number of the typical enzyme poisons. Inhibition was also produced by several derivatives of the thiazole and pyrimidine fractions of thiamine, particularly the aminobenzyl-thiazole derivative. The nature of the inhibition of thiamine-destruction by this compound was studied in detail.

Krampitz and Woolley (1944) demonstrated the presence of the two heterocyclic components of the thiamine molecule in the thiamine-thiaminase reaction mixture. The reaction, apparently a hydrolysis of the molecule, is complex in nature inasmuch as the free thiazole appears first, with the pyrimidine fraction being liberated much more slowly, 70 percent being freed in 8 days, in a sodium chloride extract. However, the pyrimidine moiety was freed as rapidly as the thiazole portion in a tissue suspension. A second enzyme not extractable with the salt solution appears to be involved. Use of mold cultures having specific requirements for each fraction of the molecule made it possible to follow the course of the reaction. Mucor ramannianus required either thiamine or the thiazole fraction while the pyrimidine moiety was essential to the growth of Endmyces vernalis.

The dual nature of thiaminase was shown by dialysis. The dialyzate contained only about 10 percent of the original activity, and the non-dialyzable portion slightly more, while almost the original strength could be restored by again mixing the two fractions. It was found that only the non-dialyzable fraction was heat labile, inasmuch as the boiled dialyzate was as effective as the unboiled in restoring activity when added to the solution remaining in the cell.

These investigators used viscera from freshly-caught carp in preparing their extracts and suspensions, and they reported an unusually high potency for this raw material. They isolated and identified chemically the thiazole and pyrimidine fractions and in one such preparation, 900 grams of viscera completely split 1 gram of pure thiamine, while standing overnight. This is equivalent to the destruction of 1,100 micrograms of thiamine per gram of fresh viscera. They found thiaminase active over a pH range of 1 to 8, with about a fourfold increase in rate of action at pH 8. Within a temperature range of 0° to 37° C., the rate of destruction was increased by about one-half.

Bhagvat and Devi (1944) reported thiaminase to be about 25 times as concentrated in the viscera and blood of carp as in the flesh. They studied its action under dialysis and the stability of the fractions thus separated, their conclusions being in agreement with the work of Krampitz and Woolley. They compared the thiaminase of carp with a similar substance which they found in a number of oil seeds native to India: ragi (Eleusine coracona), linseed, cottonseed, and mustard seed, also in rice polishings and mung bean (Phasealus aureus). The destructive principle was similar to fish "thiaminase" in that it was made up of two fractions separable by dialysis, which differed in stability to heat. The different sources varied in the proportions of the two fractions which were present. Ragi and cottonseed have predominantly the heat stable fraction which showed no loss in activity on autoclaving at 15 pounds pressure for 15 minutes or boiling for one-half hour. These investigators assumed that the reaction in this case was not enzymatic because of the stability to heat of the active principle and also the relative rapidity of the thiamine-destructive action. There is evidence, however, in the results of growth tests using mosquito larvae (Aides albopictus) that the reactions are chemically similar, that is, there is splitting of the molecule in each case. The thiamine-free product of ragi-thiamine digestion was as effective for growth as an equivalent amount of pure thiamine. However, the larvae were unable to utilize the decomposition products of thiamine produced by autoclaving, or treatment with sodium sulfite or sodium hydroxide. Pigeons and rats were unable to utilize the products of the ragi-thiamine digestion nor could thiamine be eluted from the solid residue by any solvents. The active principle was almost insoluble in salt solutions but easily extractable with a water-chloroform mixture.


CARP

Sure and Ford (1943) also report a substance in milk which destroyed 32 to 65 percent of added thiamine during incubation at 37° C. for periods up to 48 hours. This rate of reaction is much slower than that of the destructive enzyme of fish.

Weswig, et al, in 1946, reported the presence of a thiamine-destructive principle in yet another substance, not of aquatic origin. In a study of "fern poisoning" of horses and cattle that had eaten the fern, Pteris aquilina, the authors fed rats rations containing 40 percent of ground, air-dried fern. The thiamine content of the ration was estimated at 0.2 to 0.6 milligram per 100 grams but the rats lost weight in 10 days, and most of them died in another 20 days with symptoms characteristic of thiamine deficiency. When the animals were fed 0.5 milligrams of thiamine per day, all rats made good gains in weight over a 5-week period, proving the diet mixture with 40 percent fern to be otherwise innocuous. In stability towards heat, the active principle in fern resembles that found in oil seeds by Bhagvat and Devi (1944), rather than fish thiaminase. There was little decrease in activity when the dry fern was heated for 18 hours at 105° C.

It would appear that fish are not unique in the possession of a thiamine-destructive principle. Similarly acting, if not chemically identical, substances have been found in several materials of unrelated plant origin, and it seems probable that continued investigation will demonstrate that these or other anti-vitamins are more prevalent than has hitherto been considered.

Aside from the papers by Bhagvat and Devi, the only reports originating outside the United States of the occurrence of thiaminase have been from the Scandina-

vian countries. Green, et al, (1942-A) remarked that the same type of paralysis that they had studied had been reported in Norway in 1938 and in Sweden in 1939, on commercial fur farms. It had not been recognized at that time as a nutritional deficiency disease related to consumption of raw fish. However, in 1944, Lieck and Agren report the presence of a thiamine destructive substance in 10 out of 21 species of fresh-water fish in Sweden. Nine of the ten species containing thiaminase were of the carp family. They also found that 9 salt-water species did not contain thiaminase.

Sealock, et al, (1943) have made the only quantitative study of the distribution of thiaminase in the organs of carp. In some cases, the same organs from different fish were assayed separately and a considerable range in values was observed with no apparent correlation to sex or size. The data proved little more than that the quantity of thiaminase in members of a species will show a large degree of variation. The thiamine content of species containing the vitamin has been observed to be as widely variable. The spleen was found to contain the greatest concentration of thiaminase, amounting to as much as 25 units per gram. The liver, pancreas, gastro-intestinal tract, and gills (3 samples of each) contained from 1.5 to 8.7 units per gram. The kidneys and blood contained 0.75 to 1.4 activity units per gram; ovaries, 0.6 unit, and the heart, testes, brain, gall bladder, bile, mucous, and eyes contained less than 0.3 unit per gram. The swim bladder and muscle tissue were reported to contain no thiaminase.

The thiaminase is seen to be very widely distributed in the body but its function in the metabolism of the fish is unknown. Also, there is no explanation for its presence in some species and absence from others, often of rather closely related genera.

Numerous contradictions are to be found in the literature concerning the presence or absence of thiamine or thiaminase in the different species of fish, both from fresh and salt water. There are perhaps four possible explanations for this. The portion of the fish used for analysis is certain to influence results. There are unpublished data (Deutsch and Halser, 1943) which indicate that both thiamine and thiaminase may exist simultaneously in the living tissue, and other sources indicate that in some species, for example, burbot, thiamine may be present in the flesh, and thiaminase in the viscera. In this case, assays of the viscera, the edible portion, or the whole fish, would show respectively, thiaminase, thiamine or either one, depending on the proportion of each present.

The method of assay is an important factor. The chemical methods are much more sensitive in detecting small amounts of thiamine than are the animal tests with foxes, chicks, rats, and cats. However, Myers of this laboratory (unpublished data, 1946) has shown that the thiochrome method as used in the assay of cereals cannot be directly and indiscriminately applied to the assay of thiamine in fish. Interfering substances, which are difficult or impossible to eliminate, may be encountered. For this reason, low values reported for thiamine, as for example, the values for starfish of 7 to 17 micrograms per 100 grams reported by Sautier (1946), may result from other substances and do not preclude the presence of thiaminase. Lastly, it seems quite possible that thiaminase may be present in one species of fish and absent in a closely related species from other waters or possibly even may be absent from the same species seasonally or at certain stages of development. The data at hand are not sufficiently complete to permit a final conclusion as to the significance of any of these possible variables.

SPECIES THAT CONTAIN THIAMINASE

With this explanation of the conflicting data, the species reported in the literature to contain thiaminase follow: Green, et al, (1942-A) reported thiaminase in frozen whiting (whole) and canned Pacific mackerel based on reports of Chastek paralysis of foxes which had been fed these fish. Carp has always been found to contain thiaminase. Raw smelt has been shown by feeding tests to contain this enzyme. Smith and Proutt (1944) fed cats a diet of raw fish exclusively, producing deficiency symptoms with carp and herring (salt-water species). Negative results were obtained when perch, catfish, butterfish, and spots were fed. The cat, however, is relatively slow to show symptoms of thiamine deficiency.

HARD SHELL CLAM

Melnick, et al, (1945) found thiaminase in hard clams. One hundred grams of minced raw clams destroyed 8 milligrams of thiamine in vitro or several times the recommended daily allowance for adults. However, several human subjects ate the same amount of whole raw clams, with only about a 50 percent loss of thiamine intake. In vitro tests showed small amounts of thiaminase in marinated herring but none in oysters, smoked carp, or salmon.

Deutsch and Halser (1943) using a chemical method, tested 31 species of fresh-water fish and 9 species of salt-water fish for thiaminase. They found thiaminase present in eviscerated whitefish and in the viscera of Menominee whitefish, carp, white bass, sauger, pike, and burbot. It was found in the whole fish in goldfish, smelt, chub, fathead, minnow, mud minnow, sucker, shiner, channel catfish, and bullhead. Fresh-water species free of thiaminase were herring, several varieties of trout, gar pike, and dogfish. None of the marine species tested showed the destructive enzyme. Whole fish were used in testing redfish, mackerel, whiting, lemon sole, blackback, yellowtail, and dab, but the cod and haddock tested were eviscerated.

Wolf, in 1942, was probably the first investigator to report thiaminase in a salt-water fish, namely, the Atlantic herring (Clupea harengus). He also reported its presence in the buckeye shiner (Hotropus atherinoides). These results were obtained from feeding experiments in which hatchery-bred trout were the experimental animals. The symptoms of thiamine deficiency exhibited were not unlike those of higher animals, being mostly of a neurological nature, and similar brain lesions were observed on histological examination.

Yudkin (1945) in the course of an investigation as to the possibility of utilizing certain "trash" or undesirable fish of the Long Island Sound area, tested whiting, sea robin, cunner (Tautogolabrus adspersus), and tautog or blackfish (Tautoga onita) using the viscera only. None was found to contain thiaminase. He concluded that thiaminase occurs very rarely in strictly marine species, only herring having been reported to contain it at that time. It has since been reported in the hard clam of the Atlantic Coast (Melnick, et al, 1945).

Sautier (1946), on the other hand, reports from 68 to 140 micrograms of thiamine per 100 grams of sample in 5 genera of clams from Alaskan waters. Of most interest among the numerous other species he reports containing thiamine is the Pacific herring (Clupea pallasu). The flesh contained small amounts, ranging from 11 to

40 micrograms per 100 grams, with larger amounts in the herring milt, roe, and viscera. A single sample of mussels (Mytilus edulis) was reported to contain 162 micrograms per 100 grams. All these data were obtained with the thiochrome method.

MUSSELS (MYTILUS EDULIS)

Goldbeck, of this laboratory (1947), assayed a number of fresh and canned fish for thiamine by the thiochrome method. When low values or no thiamine were found, the material was tested for the presence of thiaminase by addition of thiamine. She found thiamine present in the edible portions of burbot, lake herring, whiting, and in Boston, Spanish, and king mackerel, but reports thiaminase in carp, smelt, menhaden, and mussels. The latter two marine species had not previously been reported as containing thiaminase.

The mussels (Mytilus edulis) were of the same species that had been reported in the data from the Alaskan sources (Sautier, 1946) as containing thiamine. The whole mussel meat was used in both instances so that it is difficult to account for the opposite results obtained.

From experimental data obtained by the author, two additional marine animals can be added to the list of species which contain the thiamine-destructive enzyme. The ocean or black quahog (Artica islandica) was found to contain this enzyme by chemical methods. Earlier, the common starfish (Asterias forbesi) of the shore waters of the Atlantic Coast had been shown to contain thiaminase by several series of feeding tests with both rats and chicks. Previously, Sautier (1946) reported very small amounts of thiamine in 3 Pacific species of starfish, using chemical methods. Hutchinson, et al, (1946) reported similar observations on the starfish, using microbiological methods.

It was noted in an assay for thiamine by the rat growth method that rats receiving ground raw starfish as a supplement to the thiamine deficient basal diet were in much worse condition than the control group fed only the thiamine deficient diet. Two-thirds of the rats on the highest level, 1½ grams starfish per day, developed severe polyneuritis, while the rats fed the control diet averaged 8 grams a week gain. The addition of 150 micrograms of thiamine per 100 grams of basal diet stopped the loss in weight of the rats receiving starfish, and in a short time, resulted in these rats making large gains in weight.

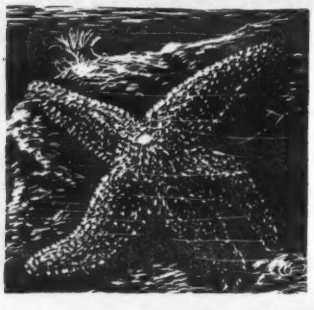
Quantitative estimation of the thiaminase present was made difficult by the refusal of the rats to eat the raw starfish supplement completely or consistently. In later tests, it was mixed directly into the diet at a 10 percent level, but even this was not entirely satisfactory as the starfish probably still had a depressing effect on the appetite of the rats. It was concluded after running 4 series of test animals that 1 gram of raw starfish destroyed about 4 micrograms of added thiamine, when both were mixed in a thiamine deficient diet. It seems probable that in vitro tests would show an even greater concentration of thiaminase but at that time (1942), facilities for the assay of thiamine by the thiochrome method were not available.

Feeding tests with chicks were conducted for the purpose of finding the value of starfish meal as a protein supplement in a commercial-type mash mixture containing corn, bran middlings, soybean oilmeal, etc. This diet, therefore, contained considerable thiamine from natural sources. Abnormally high levels of starfish meal, amounting to 32 percent of the whole mash, were fed to two groups of the

first lot of chicks to study the effect of the excessive amounts of calcium thus introduced, This work will be reported in detail in another paper. Of interest, is the fact that chicks fed this diet grew very poorly, with 50 percent mortality at the end of 3 weeks. The remaining chicks in both groups showed considerable improvement and better growth with the addition, after 3 weeks, of 100 micrograms of thiamine per 100 grams of mash. After 2 more weeks, the amount of thiamine supplement was doubled for one group with a further improvement in rate of gain in liveweight. There were no more deaths after the addition of the thiamine.

This seemed conclusive proof that thiaminase remaining in the starfish meal had been the primary cause of mortality and poor growth, rather than the excess of calcium or any other factor.

The starfish meal had been prepared by drying the raw starfish in large galvanized sheet iron pans in a steam oven. The mass of starfish and design of the oven were such that temperatures rarely exceeded 50° C., and 5 to 7 days were required for adequate drying. For the first 48 hours, there was considerable enzymatic and bacterial action, usually with complete breakdown of the tough exoskeleton of the starfish.



In spite of this prolonged exposure to moderately high temperatures and accelerated enzymatic, bacterial, and oxidative action, the indications are that the major part of the thiaminase present in the raw fish remained in the meal. This apparent stability is at variance with the report of destruction of thiaminase in finely ground raw smelt during drying at room temperatures (Deutsch and Ott, 1942). The presence of a stabilizing substance in starfish would seem indicated. Possibly, the enzyme is more stable at the higher pH maintained by the excess of calcium carbonate. On the other hand, smelt may contain a catalyst which destroys the destructive enzyme. This question of the stability of thiaminase at temperatures below 50° C. has been almost unexplored up to the present time.

SUMMARY

It should be emphasized that the thiamine-destructive factor, no matter how widespread the occurrence, is of negligible importance in human nutrition in this country, because a very small proportion of fish is eaten raw. Cooking of the fish destroys thiaminase. Only two seafoods of those reported to contain the enzyme are occasionally eaten raw or pickled. These seafoods, namely, clams and herring, are not consumed raw in such quantity that they might justifiably be considered dangerous or undesirable foods. The thiamine-destructive principle might be of some significance, however, in some sections of China, Japan, India, Norway, Sweden, and other smaller countries and islands where large amounts of fish are eaten raw, dried, pickled, or otherwise preserved without cooking.

It is equally true that the possible presence of thiaminase should be taken into consideration when feeding pets, farm, or fur animals. Apparently, even fish themselves develop thiamine deficiency so that caution must be used in feeding fish to fish in hatcheries.

It has been suggested (Melnick, et al, 1945, and Weswig, et al, 1946) that practical use might be made of thiaminase in the preparation of thiamine-free

experimental diets. This suggestion would seem to have merit since present methods for thiamine destruction involve autoclaving or alkaline digestion. These technics are not only involved but also require conditions which may destroy other factors of nutritional value. More important, these methods are not entirely effective as evidenced by the long preliminary feeding periods often required to produce even the initial symptoms of thiamine deficiency.

It is evident that a great deal of research work remains to be done before a clear understanding may be had of the value of thiaminase in biological processes.

At present, there seems to be a completely illogical distribution of thiaminase in various organisms. Those presently known to contain this enzyme consist of such diverse members as the fresh-water carp, a species of fern, the common starfish, seeds of native Indian plants, the salt-water menhaden, and the hard clam. Almost as difficult to understand are the great differences in heat stability of the destructive principle reported by different investigators and the large variation in amount of destructive activity.

In conclusion, it may be definitely stated that a few species of fish, mostly fresh-water forms, of those thus far reported, and some types of marine animals, contain an enzyme which is capable of splitting the thiamine molecule, rendering it unavailable for higher forms of life. The family of fish which contains this enzyme cannot be predicted with any certainty, with the exception that most members of the carp family possess it. The largest quantities are to be found in the viscera, although it is also distributed widely throughout the body of the fish. The function of thiaminase in metabolism is not known.

LITERATURE CITED

BHAGVAT, K. and DEVI, P.

1944. The anti-thiamine factor in carp. Indian Jour. Med. Res., 32: 123-30.

1944. Inactivation of thiamine by certain foodstuffs and oilseeds. Parts I and II, Indian Jour. Med. Res., 32: 131-44.

BONNER, J. and BUCHMAN, E. R.

1938. Syntheses carried out in vitro by isolated pea roots. Proc. Nat. Acad. Sci. U. S., 24: 431-38.

DEUTSCH, H. F. and OTT, G. L.

1942. Mechanism of vitamin B_1 destruction by a factor in raw smelt. Proc. Soc. Exp. Biol. Med., 51: 119-21.

------ and HALSER, A. D.

1943. Distribution of a vitamin B_1 destructive enzyme in fish. Proc. Soc. Exp. Biol. Med., 53: 63-5.

GOLDBECK, C. G.

1947. Some studies on the content of thiamine and anti-thiamine factor in fishery products. U. S. Department of the Interior, Commercial Fisheries Review, August, pp. 13-21. Also Sep. No. 182.

GREEN, R. G., EVANS, C. A., and CARLSON, W. E.

1937. A summary of Chastek paralysis studies. Minn. Wildlife Dis. Inv., 3: 173-77.

------, CARLSON, W. E., and EVANS, C. A.

1941. A deficiency disease of foxes produced by feeding fish. Jour. Nutr., 21: 243-56.

1942. The inactivation of vitamin B_1 in diets containing whole fish. Jour. Nutr., 23: 165-74.

------, EVANS, C. A., CARLSON, W. E., and SWALE, F. S.

1942-A Chastek paralysis in foxes. Jour. Amer., Vet. Med. Assn., 100: 394-402.

HUTCHINSON, G. E., SETLOW, J. K., and BROOKS, J. L.

1946. Biochemical observations on Asterias forbesi. Bingham Oceanographic Coll. Bull. 9, Art. 3: 3-6.

KRAMPITZ, L. O. and WOOLLEY, D. W.

1944. The manner of inactivation of thiamine by fish tissue. Jour. Biol. Chem., 152: 9-17.

LIECK, H. and AGREN, G.

1944. Thiamine inactivating factor in some species of Swedish fish. Acta Physiol. Scand., 8: 203-14.

MELNICK, D., HOCHBERG, N., and OSER, B. L.

1945. Physiological availability of the vitamins. II. The effect of dietary thiaminase in fish products. Jour. Nutr., 30: 81-8.

MYERS, C. S.

1946. The assay of fishery products for thiamine by the thiochrome method. Manuscript prepared for publication. U. S. Department of the Interior, Fish and Wildlife Service.

SAUTIER, P. M.

1946. Thiamine assays of fishery products. U. S. Department of the Interior, Commercial Fisheries Review, February, pp. 17-9. Also Sep. No. 126.

SEALOCK, R. R., LIVERMORE, A. H., and EVANS, C. A.

1943. Thiamine inactivation by the fresh fish or Chastek-paralysis factor. Jour. Amer. Chem. Soc. 65; 935-40.

------ and GOODLAND, R. L.

1944. Thiamine inactivation by the Chastek-paralysis factor. Inhibition of thiamine inactivation. Jour. Amer. Chem. Soc. 66: 507-10.

SMITH, D. C. and PROUTT, L. M.

1944. Development of thiamine deficiency in the cat on a diet of raw fish. Proc. Soc. Exp. Biol. Med. 56: 1-3.

SPITZER, E. H., COOMBES, A. I., ELVEHJEM, C. A., and WISNICKY, W.

1941. Inactivation of vitamin B_1 by raw fish. Proc. Soc. Exp. Biol. Med., 48: 376-9.

SURE, B. and FORD, Z. W.

1943. Influence of incubation at 37° C. on stability of thiamine and riboflavin in cows's milk. Proc. Soc. Exp. Biol. Med. 54: 83-5.

WESWIG, P. H., FREED, A. M., and HAAG, J. R.

1946. Anti-thiamine activity of plant products. Jour. Biol. Chem. 165: 737.

WOLF, L. D.

1942. Fish diet disease of trout. A vitamin deficiency produced by diets containing raw fish. N. Y. State Cons. Dept., Fish. Res. Bull., No. 2.

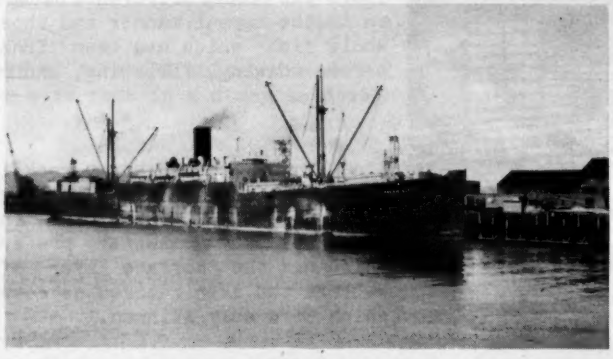
WOOLLEY, D. W.

1941. Destruction of thiamine by a substance in certain fish. Jour. Biol. Chem., 141: 997-8.

YUDKIN, W. H.

1945. Occurrence of thiaminase in marine teleosts. Proc. Soc. Exp. Biol. Med., 60: 268-9.

FREEZING FISH AT SEA



At intervals during the past several years, plans have been prepared for a complete factory ship--that is, a vessel of sufficient size to contain freezing, canning, and byproducts equipment. A number of such vessels were in operation by the Japanese prior to the war and at present the Soviet Government is known to operate a fleet of such vessels.

The American counterpart of these vessels is the factory ship Pacific Explorer which recently returned from her maiden voyage in the South Pacific with a cargo of 2,300 tons of frozen tuna. This vessel was authorized by the Defense Plants Corporation, a subsidiary of the Reconstruction Finance Corporation, in the last months of the war.

--Fishery Leaflet 278

RESEARCH
IN SERVICE LABORATORIES

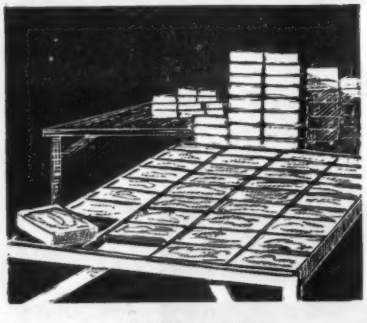
FEBRUARY 1948

Seattle, Wash.

Assays were conducted for vitamin A and oil content of seal livers collected last summer in the Pribilof Islands. The results show considerable variation in vitamin A content between individual livers.

* * *

Frozen flathead and yellowfin flounder fillets were examined after 21 weeks of storage at 0° F. All samples were slightly yellowed on the surface and slightly flat in flavor. They were still very edible. There was little difference between fillets frozen in the normal manner and those prepared from whole fish which had been frozen for 11 weeks before thawing, filleting, and refreezing.



FROZEN FILLETS

* * *

Frozen red and brown rockfish fillets were examined after 6 weeks of storage at 0° F. Although there was no difference in appearance and flavor, the taste testers preferred the fillets which had the surface layer of fatty flesh as well as the skin removed as compared with those which were only skinned.

* * *

Seven lots of frozen king crab were examined after 25 weeks at 0° F. Samples packed in cellophane bags and in tin cans with one percent salt were equally good. These packs were superior to those placed in single seamed cans.

* * *

The meat from frozen whole crab legs and that from frozen whole cooked legs were inferior to packaged crab meat in appearance and flavor. Samples showed only moderate loss in flavor due to storage.

* * *

Several fish meals and stickwater concentrates were prepared from salmon cannery waste materials for possible use in hatcheries.

Beaufort, N. C.

Several conferences were held in Morehead City regarding marking of wreck locations that are detrimental to bottom fishing gear. Arrangements are being made for the operators of shrimp trawlers, ocean trawlers, and menhaden boats to report to the Laboratory their contacts with submerged coastal obstructions.

* * *

A system has been developed at the Laboratory by which accurate, strong, and relatively light weight models of fish can be made.

* * *

Preliminary tests were made on a continuous processing machine for cleaning and opening oysters.

Boston, Mass.

A paper entitled "Antioxidant Dips for Frozen Mackerel Fillets" was prepared for publication. Preliminary studies indicate that dipping fillets in various solutions of gallic acid, ascorbic acid, and NDGA followed by a second dip in a solution of ascorbic acid plus an extractive from Irish moss extends the keeping quality of frozen mackerel fillets.

College Park, Md.

Canned packs of carp and mullet for sandwich spreads were prepared. Three packs of whiting were made in a study to develop a satisfactory canning method.

* * *

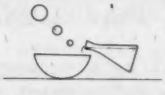
Considerable time was spent in developing and testing large quantity fish recipes for use in the cooperative school lunch project being conducted by the Service and the U. S. Department of Agriculture.

* * *

After four months in frozen storage, sea trout fillets which had been prepared and frozen within a few hours after the fish were caught showed slightly less drip upon thawing and somewhat higher palatability scores than samples prepared from fish that were frozen and thawed prior to cutting the fillets.

Ketchikan, Alaska

Sixty-two gallons of processed ground salmon waste were prepared for use in tests to determine its utility as feed for mink and other fur-bearing animals.



Additions to the Fleet of U. S. Fishing Vessels

Forty-seven vessels of 5 net tons and over received their first documents as fishing craft during February 1948, compared with 71 during the same month in the previous year, according to information received from the Bureau of Customs of the Treasury Department. During January and February 1948, a total of 92 vessels were documented, compared with 135 during the same period in 1947, and 85 vessels during the first two months of 1946.

Vessels Obtaining Their First Documents as Fishing Craft

Section	February		Two mos. ending with Feb.		Total
	1948	1947 1/	1948	1947	1947
	Number	Number	Number	Number	Number
New England	1	4	3	5	75
Middle Atlantic	2	3	2	7	70
Chesapeake Bay	4	3	5	8	97
South Atlantic and Gulf	28	32	46	62	490
Pacific Coast	9	25	25	39	411
Great Lakes	1	-	2	5	74
Alaska	1	3	7	5	47
Hawaii	1	1	2	4	23
Unknown	-	-	-	-	12
Total	47	71	92	135	1,299

1/Revised.
Note: Vessels documented by the Bureau of the Customs are craft of 5 net tons and over.

Changes in Alaska Management Announced

A new plan for closer coordination in the management of Alaska's vast fish, game, and fur resources will soon be put into operation, according to an announcement made on April 8, 1948, by Albert M. Day, Director of the Fish and Wildlife Service.

Mr. Day, who met with the Alaska Game Commission and other Alaska personnel recently in Ketchikan, in announcing the plan said, "We are attempting to make the fullest possible use of our limited Alaska personnel."

Effective May 1, all Fish and Wildlife Service functions in Alaska, with the exception of those performed in the Fishery Technological Laboratory at Ketchikan and the fur-seal work on the Pribilof Islands, will be under the general supervision of a Regional Director for Alaska, whose headquarters will be at Juneau.

Under the Regional Office will be a supervisor of wildlife, a supervisor of fisheries, and a supervisor of law enforcement who will head a combined force of field agents.

In the Washington headquarters office, an Alaska Committee will be set up to assist in carrying out these plans.

Clarence J. Rhode, with many years of experience in the Alaska program, will be the new Regional Director, relieving Frank W. Hynes, who has requested the opportunity to devote his full time to fishery management problems.

Announcement of other personnel to head the new Alaska fish and wildlife set-up will be made at an early date, said Director Day.

Notes on the Fisheries of Virginia

AIRPLANE PATROL: Following the successful experiment of Maryland in airplane patrol for fisheries enforcement, Virginia has added a plane policeman to its official staff. The plane is stationed at Exmore on the Eastern Shore, from which it can reach any point in tidewater Virginia on short notice. Maryland has found that fines from plane arrests virtually pay the costs of plane and maintenance. Virginia's experience so far points to similar results.

WINTER CRAB-DREDGING: A greater number of vessels than in any recent year engaged in winter crab-dredging during the 1947-48 season which ended March 31. Hampton, once the principal port for crab-dredging, is now second to Cape Charles, which is convenient for shipping by truck to Crisfield where the majority of Virginia's winter-caught crabs are now used.

GILL-NETTING: Gill-netting for croakers is a new kind of fishing activity at Cape Charles and has made that port another good source of the readily-salable fish. This spring also saw the first gill-net fishery of any size for mackerel off the upper North Carolina coast. A large part of the catch was handled by Virginia dealers for shipment to out-of-State markets, especially in the north.

MODIFIED HAUL SEINE: The principal gear used by commercial fishermen in Back Bay is a specially-modified haul seine.

The typical Back Bay haul seine is about 250 yards long and a yard wide. It has a large stake fixed to each end and a series of smaller stakes attached to the net along its whole length which divide it into small pockets.

Two men fish the net from a motorboat. The stake at one end is thrust into the bottom in a water depth of perhaps 6 feet. Then the boat describes a wide circle paying out the net until the other end-stake is brought round to the first. As the net is hauled aboard, the fish are retained in the small sections or pockets formed by the series of light stakes. Carp is the principal catch, with catfish and two species of perch next.

Wholesale and Retail Prices

The wholesale index for all commodities on February 14 showed a decline of 3.5 percent compared with the previous month, but was still 11.6 percent higher than the corresponding period in 1947, according to the Bureau of Labor Statistics, U. S. Department of Labor. Following the same trend, the wholesale index for foods declined 4.4 percent compared with the previous month, but was still 7.7 percent higher than the corresponding period in 1947.

Although wholesale prices of farm products and foods dropped, the average wholesale prices of canned pink salmon rose 0.6 percent and canned red salmon 0.5 percent.

Wholesale and Retail Prices

Item	Unit		Percentage change from--	
Wholesale: (1926 = 100)		Feb.14,1948	Jan.17,1948	Feb.15,1947
All commodities	Index No.	159.7	-3.5	+11.6
Foods	do	173.3	-4.4	+ 7.7
		Feb.1948	Jan.1948	Feb.1947
Fish:				
Canned salmon, Seattle:				
Pink, No. 1, Tall	$ per doz. cans	5.171	+0.6	+67.0
Red, No. 1, Tall	do	6.402	+0.5	+19.4
Cod, cured, large shore, Gloucester, Mass.	$ per 100 lbs.	14.50	0	- 3.4
Retail: (1935-39 = 100)		Feb.15,1948	Jan.15,1948	Feb.15,1947
All foods	Index No.	204.7	-2.4	+12.3
Fish:				
Fresh and frozen	do	276.3	+2.1	+14.1
Canned salmon:				
Pink	¢ per lb. can	51.6	-0.4	+41.0

Retail food prices, influenced by the early February break in commodity market prices, declined 2.4 percent compared with the previous month, but continued to be 12.3 percent higher than the corresponding period in 1947. On the other hand, the retail index for fresh and frozen fish rose 2.1 percent compared with the previous month and was 12.3 percent greater than the corresponding period a year ago. However, the average retail price of canned pink salmon dropped 0.4 percent compared with the previous month, but continued to be higher than for February 15, 1947.

Purchases of Fish by Department of Agriculture

The United States Department of Agriculture reported 6,465 pounds of frozen fillets and 1,385 cases of canned fish purchased for the school lunch program during March 1948, compared with 150,058 cases of canned fish during March 1947.

Purchases of Fishery Products by USDA

Commodity	Unit	March 1948		Jan. thru Mar. 1948	
		Quantity	Cost	Quantity	Cost
FISH			Dollars		Dollars
Fillets, cod, frozen	lbs.	4,080	1,428	4,080	1,428
" , whiting, "	"	2,385	598	2,385	598
Total	"	6,465	2,026	6,465	2,026
Herring, canned 1/	Actual Cases	-	-	47,145	144,264
Pollock, flaked, canned 2/	" "	1,385	7,735	1,385	7,735
Whiting, canned 1/	" "	-	-	351	1,074
Total	" "	1,385	7,735	48,881	153,073
Grand Total		-	9,761	-	155,099

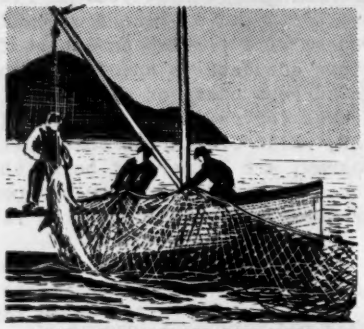
1/Actual cases contain 24 - 15 oz. cans.
2/Actual cases contain 48 - 15 oz. cans.

FOREIGN

Australia

EXTENSION OF SOVEREIGNTY: The time has come when the fishing industry of Australia must recognize the necessity for scientific management of this important natural resource, according to an editorial on an article in Fisheries Newsletter, an Australian Government periodical.

The editorial states that after investigating Australia's eastern trawling industry, a scientist on the staff of the Fisheries Division concludes that whereas fishing intensity on these grounds is at the level of 4,500-5,000 trawler-tons, the level which the fishery can stand without impairment of the fish stock is only 3,250-3,500 trawler-tons. Thus, as pointed out in an introduction to his article, investigation has confirmed repeated warnings given in the Newsletter for several years past.



SHARK FISHING OFF PORT STEPHENS HEADS, AUSTRALIA

The only question to be decided is whether the necessary reduction of the intensity of fishing is to be brought about in an orderly planned way by Government action--taken with the understanding and cooperation of the industry--or whether competition for immediate gain is to be left to reduce the fishing fleet by driving its financially weakest units out of operation. There can be only one answer to this question. For the latter course--apart from leaving the way open for another cycle of boom and depression when fish stocks had recovered after failures had reduced the fleet--offers no permanent basis for the operation of the fishery.

Scientific management of our trawling resources requires the exercise of authority, for the permanent conservation of the fishery, outside the 3-mile limit. There is only one authority that can assume such power; that is, the Commonwealth Government.

The necessary legislation to enable the Commonwealth to do so has been drafted, and it is well that fishermen should thoroughly understand the need for it; not only for the immediate conservation of the trawling grounds, but to meet any similar need in future for the preservation of other Australian fisheries, and also for the protection of any Australian fisheries against possible over-exploitation by any overseas operators.

By the proposed legislation, Australia will not set any precedent. Since President Truman's declaration in September 1945, assuming similar powers for a similar purpose outside the 3-mile limit around the United States coast, Mexico,

Peru, and the Argentine have taken to themselves the same authority. New Zealand is considering similar action and, it is understood, will first consult Australia.

Australia must assume control of the waters of her Continental Shelf in order that any deep-sea fisheries management plan can be put into operation. Implementation of this by Act of Parliament would be non-controversial and a matter of first importance.

Canada

AUTHORIZES PURCHASES OF FISHERIES PRODUCTS: On March 25, 1948, the Canadian Privy Council authorized the Fisheries Prices Support Board to purchase not more than 190,000 cases of East Coast canned fish of the varieties designated below during the 12-month period ending March 31, 1949. According to information received, this purchase program represents a decrease of 25 percent in Government purchasing of these types of fish from the level of 1947 when large quantities were purchased on behalf of UNRRA and post-UNRRA relief programs. However, this program will provide an outlet for approximately half the expected product, at prices adequate to ensure the continuance of this sector of the industry during the current phase of adjustment, maintaining--to that extent--diversification of markets for raw fish. According to Canadian sources, the prices prescribed for 1948, while similar to those paid in the latter part of 1947 under the post-UNRRA program, are 10 percent below the levels established under the UNRRA program. They are also approximately 10 percent below the currently prevailing market prices for these varieties of canned fish.

It should be emphasized that the order of the Privy Council specifically contains a provision that in the purchase contracts a condition should be included that prices paid to fishermen for fish be comparable to those paid in 1947. Varieties designated for purchase, together with the prices authorized, are as follows:

Kind	Cans per case	Ounces per can	PRICES Fancy (per case)	PRICES Standard (per case)
			$	$
Chicken haddie and flaked fish, flats	48	14	9.00	8.00
Finnan haddie, flats	48	14	9.50	-
Flaked fish, "	96	7½	9.50	8.50
Herring, talls	48	10	4.75	4.35
Herring, talls and flats	48	15	5.35	4.75
Mackerel, talls	48	15	8.25	7.25
Mackerel fillets, talls, and flats	48	15	9.00 (Plus 50¢ per case if packed in wooden boxes metal strapped.)	8.00

Note: F.O.B. Supplier's nearest shipping point.

No indication is given as to the disposal of this fish.

China

ENFORCEMENT MEASURES FOR DEVELOPMENT OF FISHERIES: The National Economic Council (NEC) of China during January 1948 agreed upon pertinent enforcement measures for currency and finance, agriculture, communications, and commerce in regards to suggested enforcement measures for an economic reform plan for China, according to a report submitted by the American Embassy at Nanking, China. Those measures affecting China's fisheries are designed to develop fishery and marine products in seas, rivers, and lakes, to encourage farmers to raise fish, and to encourage the processing of marine products.

Among the enforcement measures for the development of the commercial marine fisheries are the following: to strengthen and supervise marine fisheries, improve fishing craft and equipment for purposes of increasing production, and strengthen the organization and training of fishermen and technical personnel. In addition, the measures call for the increase of culture of fresh-water fish, development of culture and breeding of salt-water fish, the development of processing enterprises for marine products, regulation of production and marketing of fishery products, and the development of fishing communities.

Iceland

ANTI-INFLATION LAW: The Icelandic Government passed on December 29, 1947, a law to control inflation. Among the provisions were several affecting the fisheries. They are, briefly, as follows:

For the motorboat fishery, the Government guarantees a price of 4.6 cents per pound for fresh fish based on drawn cod and haddock. Prices for other fish shall be in proportion. The National Federation of Icelandic Fish Producers are to be consulted in fixing these prices.

The freezing plants are guaranteed the difference between the selling price f.o.b. of cod fillets and 20 cents but the guarantee will not be more than 5½ cents per pound. The Government may even pay for part of the storage of frozen fish caught during the winter season if the fish are exported before August 1, 1948.

For exporters of salt fish, there is a guarantee based on the difference between the selling price f.o.b. and 15.9 cents per pound. This is based on first class fully-cured large cod. For other classes and species, the guarantee would be less, but in proportion. The same applies to dried fish which may be exported.

If depreciation of salt fish is caused by long delay and the exporter is not responsible, he can be reimbursed for the depreciation by the Government.

In order that the fisherman will receive a minimum price of 4.6 cents per pound for fresh fish which will be exported in a form other than frozen fillets or salted fish, the Government may guarantee the price of such exported fish.

Depending on the market outlook, the Government may issue rules and regulations affecting the processing of fish.

Fresh and salt fish producers, and owners of freezing plants can be required to submit reports on their activities. Likewise, statements may be required to show that share-fishermen and fish producers who sell their catch to others have received the minimum prices.

The price of bait may be fixed by the Government. The Government may also make it a condition for the payment of a subsidy for bait, that steps be taken by the dealers to reduce the cost of bait. Resolutions concerning the use and saving of bait, if approved by a majority of fish producers at a port and confirmed by the Minister, are binding on all producers at that port. The maximum rent to be paid for fishing stations may be fixed by the Government. Stiff fines are authorized for violation of this section.

When the Government decides on the prices to be charged for fishing gear and for repairs of vessels, a representative from the operators and from the fishermen shall be called in and shall have a right to vote on such matters.

This law sets a maximum of 4 percent which can be charged for operating loans to the fisheries and to companies processing fish for export. Loans can be made up to 85 percent of the guaranteed prices.

On account of the failure of the herring fishery during 1947, companies and individuals who operated purse seines for herring in 1947 may also apply for loans from a guarantee fund of $770,000.

The Minister of Fisheries shall appoint a committee of 3 to handle the loans or grants to the purse-seine herring fishery companies and operators which must have the approval of the Minister. Loan applications must include copies of the 1947 income tax return, 1947 balance sheet, 1947 herring operating account, and mortgage certificates on vessels and real estate. The Fisheries Fund of Iceland shall handle the loans and will receive an account of the operating costs from each vessel.

A sales tax to be levied excludes taxes on sales of fresh, frozen, canned, and salted fish including herring and on sales of gear, salt, oils, and vessel repairs.

* * * * *

EXPORTS, 1947: Although Icelandic exports in 1947, which amounted to $44,723,870, were approximately equal to those of the preceding year, there were a number of variations in the relative importance of items exported. Principal commodities sold abroad during both years, according to a report submitted by the American Legation at Reykjavik, were:

	1947		1946	
	Value	%	Value	%
	$		$	
Iced fish	6.6	15	9.5	21
Frozen fish	10.6	24	9.4	21
Salted fish	7.1	16	2.9	7
Cured herring	2.0	4	4.3	10
Herring and fish meal	2.5	6	1.8	4
Herring oil	8.0	18	4.2	9
Cod liver oil	3.5	8	4.3	10

Inasmuch as the catch was about the same in both years (except for the winter herring, of which very little was exported in 1947) differences in sales abroad were largely due to variations in the mode of preparation.

The greater part of an increase in the value of frozen fish and herring oil exports, however, was due to higher prices obtained, rather than increased production. The slightly greater amount of herring processed resulted in a lesser quantity salted and cured, while more white fish was salted instead of iced.

Frozen fillets and herring oil went almost entirely to the United Kingdom and the Soviet Union, while most of the salted fish was exported to Italy and Greece. All the iced fish was exported to Great Britain, and Czechoslovakia was the largest importer of fish meal. The United States and the Soviet Union purchased most of the cod liver oil production.

NET FACTORY FIRE: About one-fourth of all herring nets stored in Iceland were destroyed on March 19, when a fire broke out in one of the two main net factories in the country. The Director of the State Herring Plants stated that inasmuch as it is very difficult to obtain material for herring nets, the destruction of these nets may have serious consequences with regard to the summer herring season.

TRADE AGREEMENT WITH CZECHOSLOVAKIA: The Icelandic Ministry of Foreign Affairs has officially announced the signing of a trade agreement with Czechoslovakia in Prague on March 11. According to the terms agreed upon, Iceland will sell quick-frozen fish, herring, and fish meal, canned fish products, cod liver oil, and sheepskins.

Philippine Islands

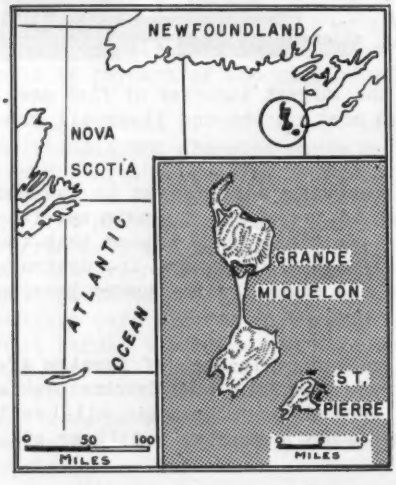
FISH PRODUCTION, 1947: The commercial catch of fish was about one-third greater in 1947 than in 1946 despite a marked decline in the catch of herring, according to figures released by the Philippine Bureau of Fisheries and recently reported by the American Embassy at Manila. The total production for 1947 was 46,295,000 pounds, compared with 34,984,000 pounds for 1946.

According to the Market and Inspection Service of the Philippine Bureau of Fisheries, 19,624,587 pounds of fresh fish valued at $8,392,339 reached the Manila market in 1947, against 15,785,008 pounds valued at $9,080,643 in 1946. The average price was $4.64 cwt. in 1947 against $5.77 cwt. in 1946. In addition, 6,160,000 pounds of iced fish and 5,128,180 pounds of frozen fish reached the Manila markets in 1947. There is no record of any refrigerated, iced, or frozen fish reaching the Manila market in 1946.

There were 612 commercial fishing boats licensed in 1947, of which 280 were powered; 358 in 1946, of which 127 were powered; and 52 in 1945, of which 40 were powered.

There were 2,903,032 pounds of fishery products valued at $791,470 exported from the Philippines in 1947 against 2,550,469 pounds valued at $654,845 in 1946. Exports of shells, which make up most of the total, increased substantially in 1947 and shipments of shell buttons were started in a moderate way. Shipments of trapang and skins (shark skins, alligator skins, etc.), a considerable factor in 1946, were negligible in 1947.

St. Pierre—Miquelon



FILLETING PLANT: The cold storage plant built in 1919 on St. Pierre, French island off the coast of Newfoundland, has been under repair for several months and is expected to go into the production of fish fillets for future export, according to a report of the American Consul at Halifax, Nova Scotia. Although constructed in 1919, the plant has been used only for storage of green fish or dry fish in casks pending exportation from St. Pierre to the United States, Puerto Rico, or elsewhere in the West Indies.

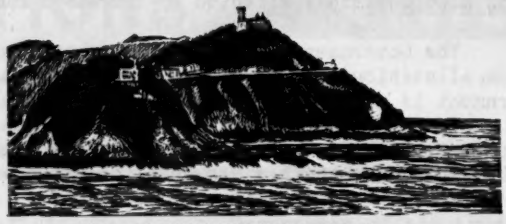
The cold storage plant is the property of the local administration at St. Pierre. It will probably be operated under a rental agreement by two companies.

It is estimated that the cold storage plant will be able to produce 20 tons of frozen fillets daily, 30 tons of fish fertilizer, and 30 tons of ice. The capacity for storage of fillets will be around 1,600 tons. However, this last figure can be increased, if necessary.

The plant will provide employment for about 150 to 200 workers in addition to the crews of the fishing trawlers.

Spain

FISHERIES REVIEW, 1947: The Spanish fishing industry was adversely affected during 1947 by a number of causes, chief of which was the steadily advancing costs of operation, according to a consular review submitted to the American Embassy at Madrid, Spain. As the year closed, there were no signs evident that the peak had been reached. The industry had hoped for Government assistance which would result in the gradual but steady return to stabilized production but this was not realized in 1947. Inflation has retarded the return to normal conditions and has created a feeling of insecurity. Under these conditions, the outlook for 1948 was not favorable.



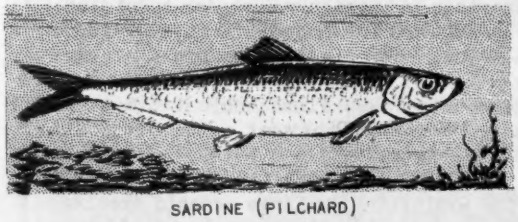
BAY OF SAN SEBASTIAN, SPAIN

Fishing Activities: The deep-sea fishing fleet, whose fishing grounds during the entire year are off the coast of Ireland and the Bay of Biscay was hampered by inclement weather the early part of the year and there were losses of numerous units through shipwreck.

Catches were significantly smaller due not only to the scarcity of fish but also to the presence of fishing vessels from other countries which, due to wartime restrictions, had previously kept to the littoral of their home ports. Statistics of the 1947 catch are not yet available, but estimates place the amount of fish brought into Spanish ports at about 50 percent lower than the previous year.

The revision of ceiling prices and the continued increasing demand for fresh fish to compensate for the lack of other foodstuffs in the domestic markets enabled the deep-sea fleet to operate profitably. Had it not been for these two factors and had the catches been as abundant as in previous years, the situation would have been reversed, since the total market value would not have paid for the heavy operating costs of the fishing ships and the result would have been the suspension of fishing operations.

It is reported that 1947 was not a profitable year for the smaller fishing craft which operate near their home ports. The activities of this branch of fishing fleet are seasonal and sardines and bonito (albacore) are the principal species that constitute the bulk of the catches. The equipment of these fleets is most primitive and accounts partly for the continuous decline in the quantities of fish caught. During the year, bonito was plentiful and brought good prices. The sardine catches, however, have been steadily declining, although towards the end of the year, the situation improved slightly owing to larger catches of small sardines (pilchard), but this type is not suitable for canning.



SARDINE (PILCHARD)

Fish Canning: The shortage of tinplate and olive oil coupled with the loss of foreign markets continue to reflect the unfavorable situation of the fish pack-

ing industry in 1947. Normally, Spain ranked as one of the leading world producers of canned fish, producing almost 3,000,000 cases a year. The history of the industry during the past 10 years is stated to have been one of a losing fight against conditions arising out of the Spanish Civil War followed by World War II. The causes are various but originated from an almost complete lack of raw materials, chiefly tinplate. During the past two or three years, the position of the industry was also adversely affected by decreased runs of sardines along the Spanish coast.

The Government control and regulation of the industry particularly as regards the allocation of materials are far from satisfactory. It appears that the Government is more interested in securing supplies of fresh fish for the home market than in the needs of the canneries. The fish canning industry in Spain is dependent upon export trade and the present economic policy of the Government of cutting off its export markets has weakened the structure of the whole industry which has now entered into a period of stagnation.

As the year closed, the position of the industry was unfavorable, and the outlook for 1948 was not very bright.

THE JAPANESE TUNA FISHERIES

During the last several decades, the tunas have assumed a position of major importance in commercial fisheries throughout the world. Much interest now centers in this group because of the tremendous demand in many countries for canned tuna products either for indigenous consumption or for their value as export items. Important fisheries consequently have been developed in North American and northern European countries. In Japan and in the Mediterranean region, however, not only are the tunas of considerable present-day importance but they have been taken since ancient times and have been among the most esteemed of all fish.

Japan is admirably situated for exploiting the large oceanic species, many of which perform wide migrations and enter its coastal and offshore waters at some time during their life histories.

--Fishery Leaflet 297

FEDERAL ACTIONS

Department of Agriculture

FISH FOR FOREIGN RELIEF: The U. S. Department of Agriculture announced on April 1 that it will no longer purchase certain commodities for Government foreign relief supply programs. In line with the recommendation of the Procurement Planning Subcommittee of the Cabinet Committee on World Food Programs, these commodities will henceforth be procured by the Quartermaster Corps, Department of the Army.

The commodities of interest to the fishing industry for which the Army will now have all procurement responsibility are whale oil and fish.

The following offices handle the purchase of foods for the Quartermaster Corps:

Quartermaster Purchase Offices:

111 E. 16th St., New York, N. Y.
1819 W. Pershing Drive, Chicago 9, Ill.
Oakland Army Base, Oakland 14, Calif.

DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

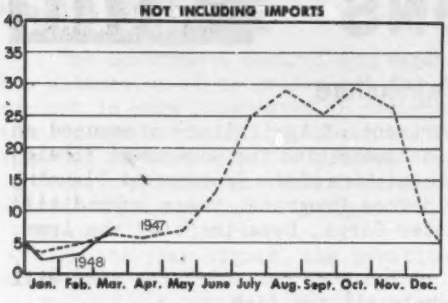
Branch of Commercial Fisheries, Washington 25, D. C. REpublic 1820

Name	Title	Rm.No.	Tel.Ext.
A. W. Anderson	Chief, Branch of Commercial Fisheries	3360	4386
R. T. Whiteleather	Asst. Chief, Branch of Commercial Fisheries	3357	4387
D. Y. Aska	Chief, Educational Section	3042	2151
W. H. Dumont	Chief, Market News Section	3348	4843-4
R. A. Kahn	Chief, Economics & Coop. Marketing Section	3347	3985
J. M. Lemon	Chief, Technological Section	3352	4745-6
E. A. Power	Chief, Statistical Section	3343	4881-2
Ralph Russell	Chief, Market Development Section	3351	4515

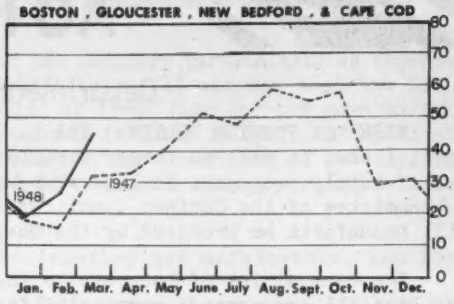
LANDINGS AND RECEIPTS

In Millions of Pounds

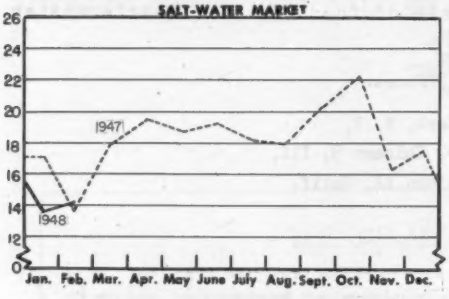
MAINE - LANDINGS
NOT INCLUDING IMPORTS



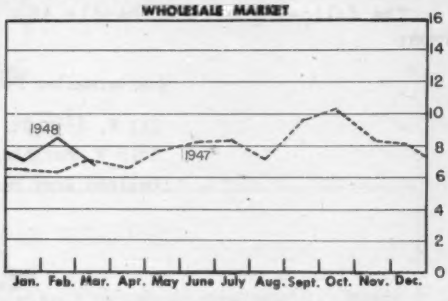
MASSACHUSETTS - LANDINGS
BOSTON, GLOUCESTER, NEW BEDFORD, & CAPE COD



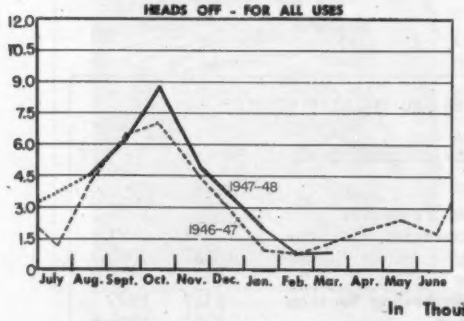
NEW YORK CITY - RECEIPTS OF FRESH & FROZEN FISH
SALT-WATER MARKET



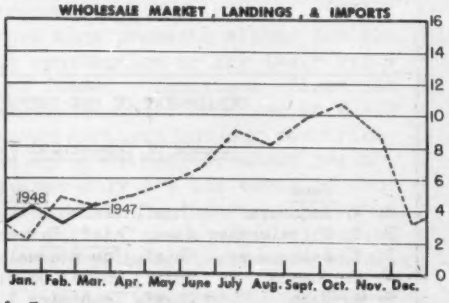
CHICAGO - RECEIPTS OF FRESH & FROZEN FISH
WHOLESALE MARKET



GULF - SHRIMP LANDINGS
HEADS OFF - FOR ALL USES

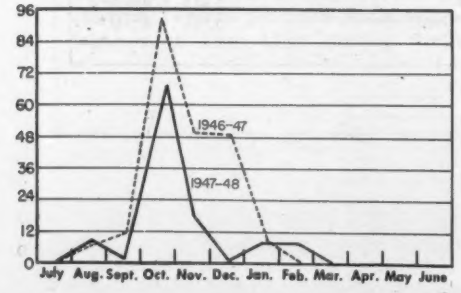


SEATTLE - RECEIPTS OF FRESH & FROZEN FISH
WHOLESALE MARKET, LANDINGS, & IMPORTS

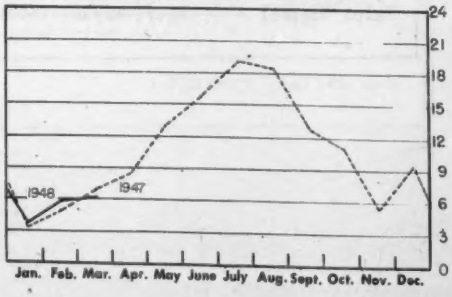


In Thousands of Tons

CALIFORNIA - PILCHARD LANDINGS



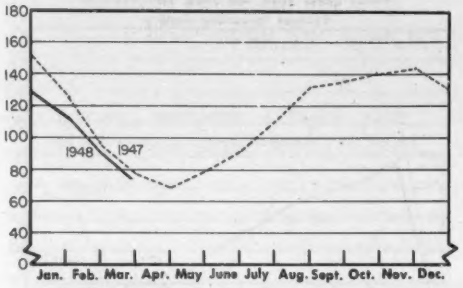
CALIFORNIA - TUNA LANDINGS



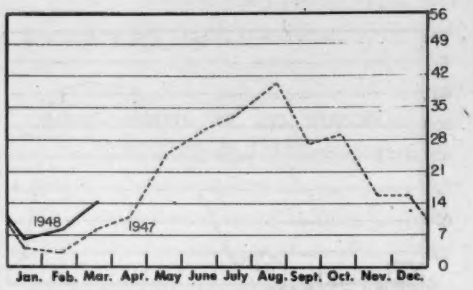
COLD STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS

In Millions of Pounds

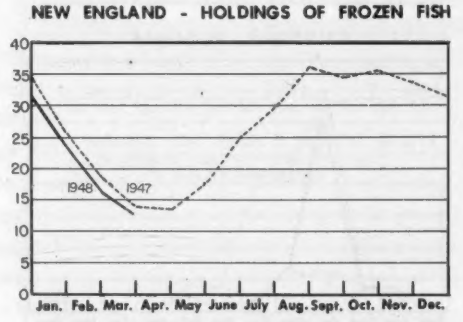
U.S. & ALASKA - HOLDINGS OF FROZEN FISH



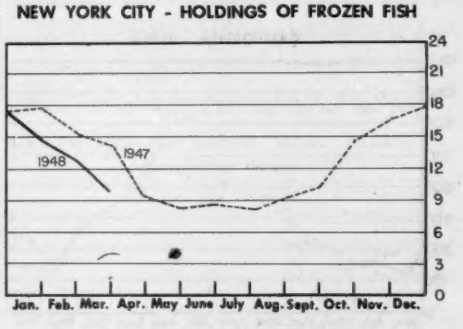
U.S. & ALASKA - FREEZINGS



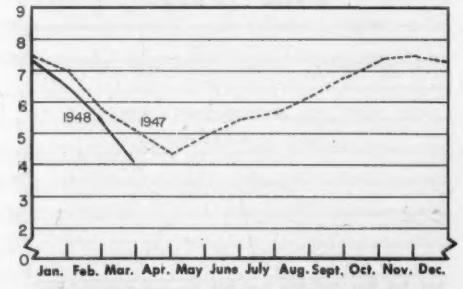
NEW ENGLAND - HOLDINGS OF FROZEN FISH



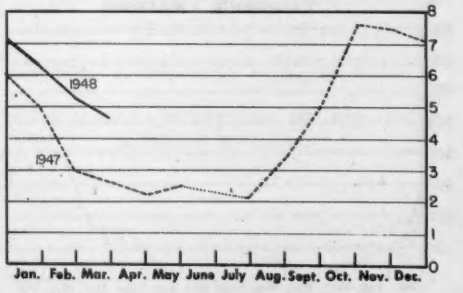
NEW YORK CITY - HOLDINGS OF FROZEN FISH



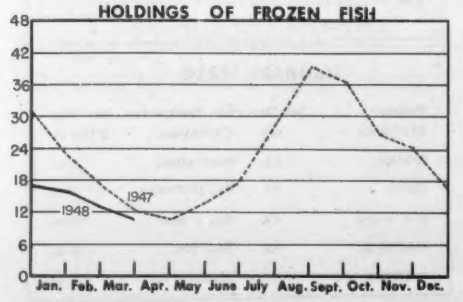
CHICAGO - HOLDINGS OF FROZEN FISH



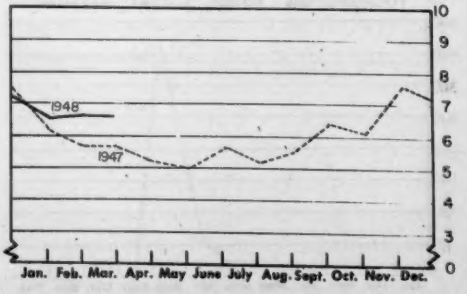
GULF - HOLDINGS OF FROZEN FISH



WASHINGTON, OREGON, AND ALASKA - HOLDINGS OF FROZEN FISH



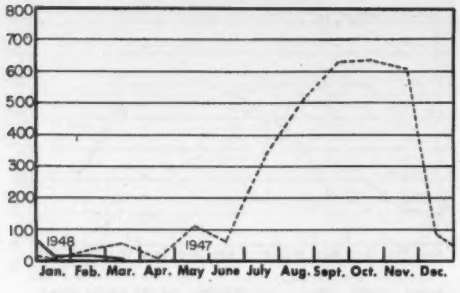
CALIFORNIA - HOLDINGS OF FROZEN FISH



CANNED FISHERY PRODUCTS

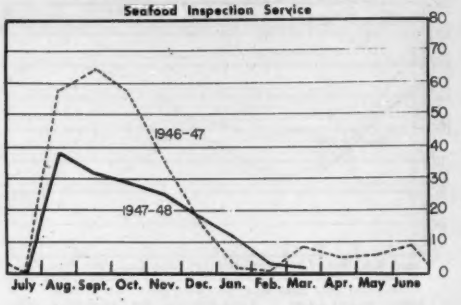
In Thousands of Standard Cases

MAINE - SARDINES, ESTIMATED PACK

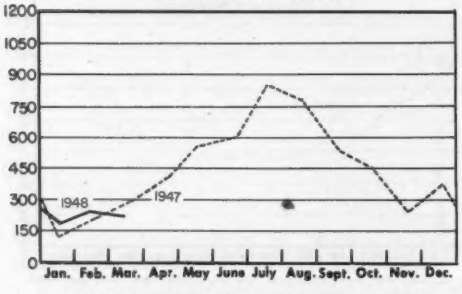


UNITED STATES - SHRIMP

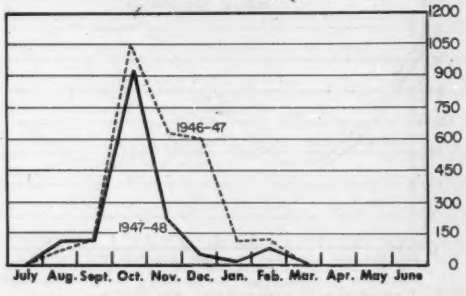
Plants under Food and Drug Administration
Seafood Inspection Service



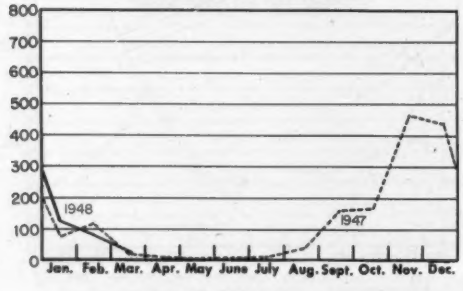
CALIFORNIA - TUNA



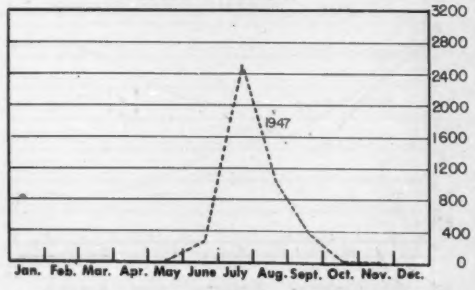
CALIFORNIA - PILCHARDS



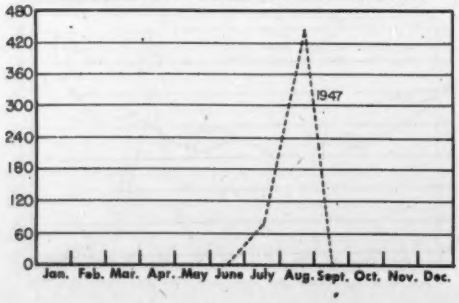
CALIFORNIA - MACKEREL



ALASKA - SALMON



WASHINGTON - PUGET SOUND SALMON

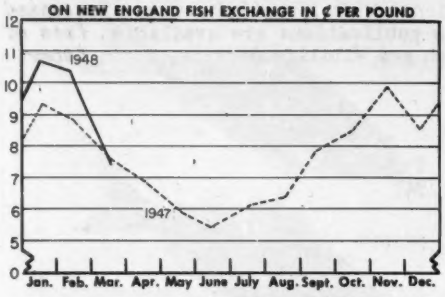


STANDARD CASES

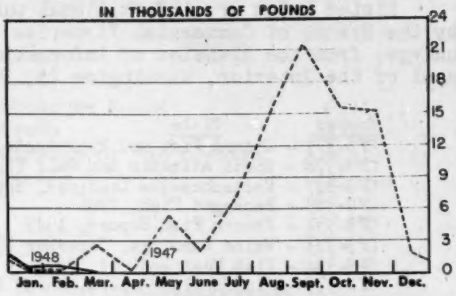
Variety	No. Cans	Can Designation	Net. Wgt.
SARDINES	100	1/4 drawn	3 1/4 oz.
SHRIMP	48	No.1 picnic	7 oz.
TUNA	48	No. 1/2 tuna	7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
MACKEREL	48	No. 300	15 oz.
SALMON	48	1-pound tall	16 oz.

PRICES, IMPORTS and BY-PRODUCTS

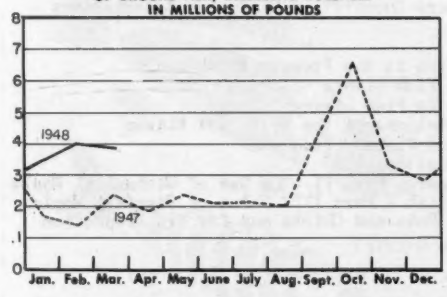
BOSTON - WEIGHTED AVERAGE PRICE
ON NEW ENGLAND FISH EXCHANGE IN ¢ PER POUND



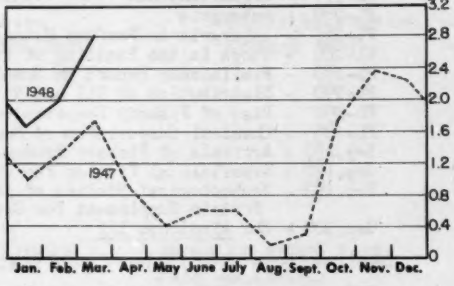
MAINE - IMPORTS OF SEA HERRING
IN THOUSANDS OF POUNDS



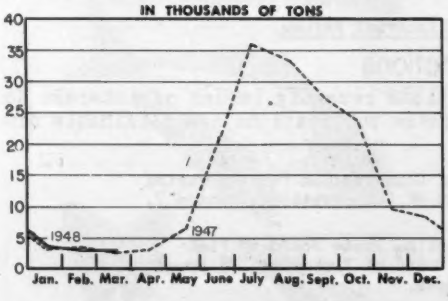
U.S. - IMPORTS OF FRESH & FROZEN FILLETS
OF GROUND FISH, INCLUDING ROSEFISH:-
IN MILLIONS OF POUNDS



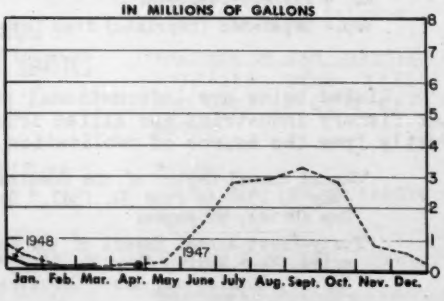
U.S. - IMPORTS OF SHRIMP FROM MEXICO
IN MILLIONS OF POUNDS

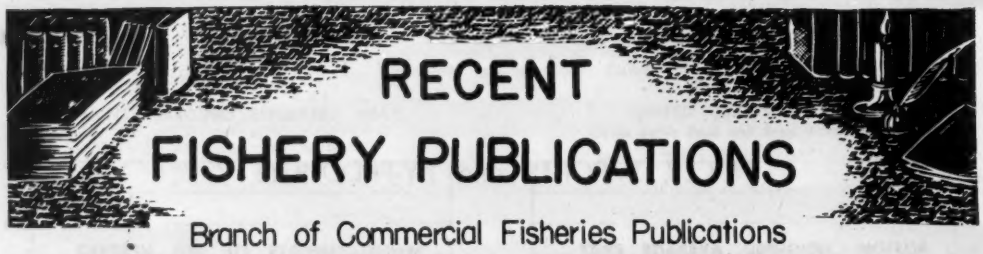


U.S. & ALASKA - PRODUCTION OF FISH MEAL
IN THOUSANDS OF TONS



U.S. & ALASKA - PRODUCTION OF FISH OIL
IN MILLIONS OF GALLONS





Branch of Commercial Fisheries Publications

Listed below are informational publications which recently have been processed by the Branch of Commercial Fisheries. These publications are available, free of charge, from the Division of Information, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

Number	Title
CFS-373	Canned Fish and Byproducts, 1946
CFS-378	South Atlantic and Gulf Fisheries, 1945
CFS-387	Massachusetts Landings, September 1947
CFS-389	Packaged Fish, 1946
CFS-391	Frozen Fish Report, 1947
CFS-393	Maine Landings, December 1947
CFS-394	Fish Meal and Oil, January 1948
CFS-395	Frozen Fish Report, March 1948
FL-255	Fishery Motion Pictures
FL-276	The "Bob" Method of Picking Blue Crabs
FL-277	Organizing and Incorporating Fishery Cooperative Marketing Associations
FL-280	Ambergris
FL-281	Ambergris in Perfume Extracts
FL-286	Steps in the Handling of Frozen Fish in the Freezer Warehouse
FL-289	Preliminary Report on Sampling of Fish Livers
FL-290	Distribution of Oil and Vitamin A in Fish Livers
FL-292	List of Fishery Cooperative Associations in the U. S. and Alaska
FL-295	Chemical Composition of Some Canned Fishery Products
Sep.197	Arrivals of Fishery Products at Seattle, 1947
Sep.198	Experimental Fishing for Red Snapper - Part II--The Use of Mechanical Reels
Sep.199	Technological Studies of the Starfish - Part III--Value of Starfish Meal--Protein Supplement for Growth of Rats and Chicks and for Egg Production
Sep.200	The Albatross III

Designations for fishery publications are interpreted as follows:

CFS - Current fishery statistics of the United States and Alaska.

FL - Fishery leaflets.

Sep.- Separates (reprints) from Commercial Fisheries Review.

Other Publications

Listed below are informational publications recently issued of interest to the fishery industries and allied trades. These publications are obtainable directly from the source of publication.

"Second Annual Report of the Commissioner of Conservation for the Period July 1, 1946 to June 30, 1947," Department of Conservation, Trenton 7, New Jersey, 92 pages.

"Forty-First Annual Report of the South Carolina State Board of Fisheries, Year Ending June 30, 1947," State Board of Fisheries, 93 Broad Street, Charleston, South Carolina, 35 pages.

Processing -- Miscellaneous Service Division

Illustrator -- Gustaf T. Sundstrom Compositors -- Jean Zalevsky and Norma D. Loeffel

38031

MARKET FORMS
OF FRESH AND FROZEN FISHERY PRODUCTS

Fresh and frozen fishery products may be purchased in a variety of cuts or forms, the more important of which are given below. A more economical product is generally assured if one of the following commercial forms is requested instead of a specialty product.

FIGURE 1.

FIGURE 2.

FIGURE 3.

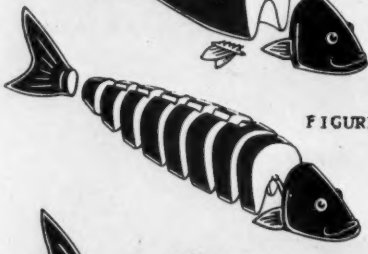


FIGURE 4.

FIGURE 5.

FIGURE 6.

FIGURE 7.

Fish

Whole or Round	Fillets
Drawn	Single
Dressed or Pan Dressed	Butterfly
Steaks	Sticks

Shellfish

Live	Headless (shrimp)
Shucked	Cooked meat

FIGURE 1. WHOLE OR ROUND FISH
FISH AS LANDED

FIGURE 2. DRAWN FISH
ENTRAILS ONLY REMOVED

FIGURE 3. DRESSED OR PAN DRESSED
ENTRAILS, HEAD, TAIL AND USUALLY FINS REMOVED

FIGURE 4. STEAKS
CROSS SECTION OF LARGEI FISH

FIGURE 5. SINGLE FILLETS

FIGURE 6. BUTTERFLY FILLETS

FIGURE 7. STICKS

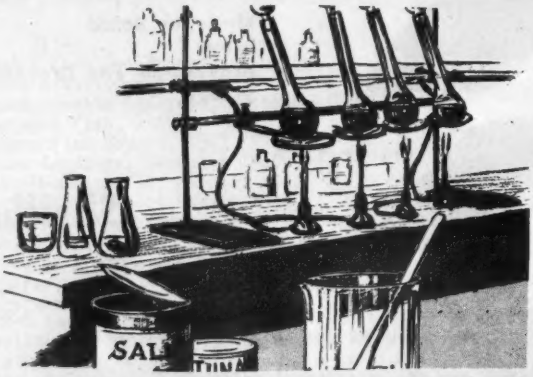
SOURCE: "FISH COOKERY FOR ONE HUNDRED" -- FISH AND WILDLIFE SERVICE

CHEMICAL COMPOSITION OF SOME CANNED FISHERY PRODUCTS

Fishery Leaflet 295, Chemical Composition of Some Canned Fishery Products, tabulates the proximate composition of a wide range of canned fishery products. This 7-page report states:

"The critical food situation existing in the world today makes it imperative that we have available comprehensive data on the composition and nutritional value of all important foods. This information permits a more effective use of the variety of available foods.

"Nutritional chemistry today teaches that the functions of food are to yield energy, build up or replace the body tissues and to regulate and maintain the body processes."



The above mentioned Fishery Leaflet can be obtained free upon request from the U. S. Fish and Wildlife Service, Washington 25, D. C.

University of Michigan General Library,
Ann Arbor,
128D Michigan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILD LIFE SERVICE
WASHINGTON 25, D. C.

OFFICIAL BUSINESS
Permit No. 1015
Form FWS - 5/48 - 2,825

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300